

RD&T Brief



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Evaluation of the Benefits of Intelligent Transportation Systems (ITS)

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Since the early 1970s, the Wisconsin Department of Transportation (WisDOT) has taken advantage of computer and information technologies, known as Intelligent Transportation Systems (ITS), to help reduce highway congestion and improve safety. Many of these technologies have appeared to be helpful in achieving the objectives for which they were deployed.

WisDOT believes ITS applications can be expanded to improve the quality of Wisconsin's transportation system for individual travelers, commercial vehicle operators, police and emergency response agencies, and private sector business and property owners.

What's the Problem?

As the number and complexity of ITS alternatives grow, there is a need for WisDOT to apply better methods to estimate the cost vs. benefit of ITS deployments, to identify promising candidate projects and compare them with more conventional solutions such as highway construction and expansion.

Research Objectives

The investigators undertook the following objectives:

1. Identify alternative approaches to ITS evaluation.
2. Develop "benefit trees" for three key ITS applications.
3. Identify WisDOT and user benefits of ITS.
4. Identify possible software for benefit analysis.
5. Conduct a break-even analysis of ITS applications likely to be used by WisDOT.

Alternative Approaches to Evaluating Benefits

Benefits of ITS deployments can be assessed in terms of a **goal-oriented** approach that measures cost of the system deployment against predefined objectives, such as reducing congestion. Local or district planners are likely to use this approach.

With the **economic analysis** approach, the estimated economic value from deploying the ITS system (e.g., dollar savings in terms of reduced travel time, fewer accidents or less pollution) is compared with the costs of installing and operating the system. This approach is more likely to be used at a statewide level to select projects with high benefit/cost ratios.

Benefit Trees Show Interrelationships

Regardless of which approach is used, it is important to consider benefits to non-users as well as users, and both long- and short-term benefits. The investigators developed benefit trees for three ITS systems (traveler information, incident management and commercial vehicle operation) as a way of analyzing interrelated benefits.

Real-time traveler information systems, for example, may result in time savings not only for travelers but also for non-travelers such as freight customers. Less congestion can mean fewer accidents and reduced pollution. The benefit tree technique helps eliminate double counting and aids in measuring non-monetary benefits such as goodwill and reduced stress.

This report is available in PDF format on the website of the Center for Urban Transportation Studies at the University of Wisconsin-Milwaukee.
<http://www.uwm.edu/Dept/CUTS/its/>

High usage of traveler information means the cost of the system is offset by relatively small time savings realized by each user.

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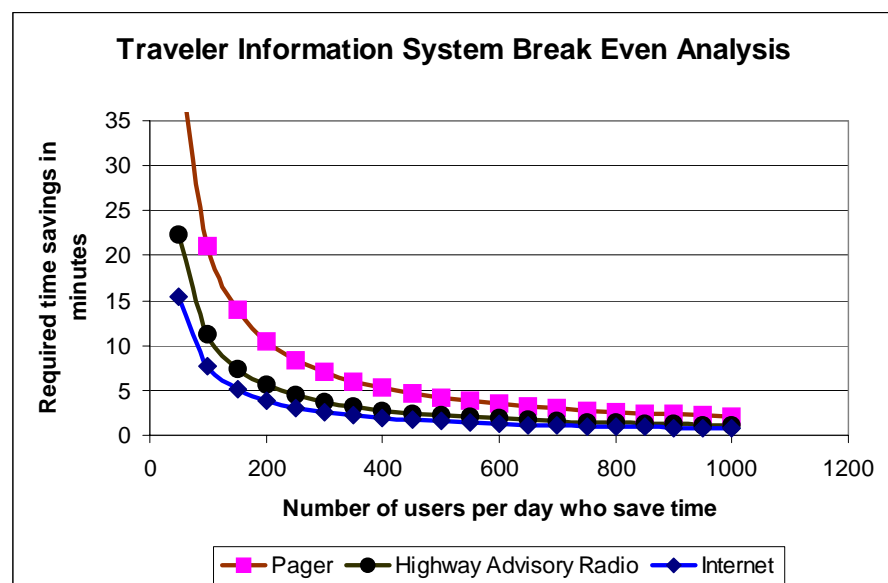
Software for ITS Benefit Analysis

The investigators discuss the merits and limitations of the following computer applications:

- ITS Deployment Analysis System (IDAS)
- Process for Regional Understanding and Evaluation of Integrated ITS Networks (PRUEVIIN)
- Transportation and Analysis Simulation System (TRANSIMS)
- Screening for ITS (SCRITS)

A modified version of SCRITS is used to perform a break-even analysis of ten ITS applications likely to be implemented in Wisconsin: ramp metering, freeway detection, closed circuit TV, highway advisory radio, variable message signs, traffic information kiosks, Internet traffic information, commercial vehicle operators kiosks, and weigh-in-motion systems.

The chart below, for example, shows that break-even time savings from three traveler information systems have to be high if only a few persons use them successfully. As the number of users increases, the break-even point drops rapidly.



The investigators conclude that "ITS systems can have significant benefits that easily exceed their costs. These benefits are especially likely to occur if the existing level of performance of the highway is poor."

Implementation

The methods developed through this study, including the SCRITS-UWM (University of Wisconsin-Milwaukee) spreadsheet, will help WisDOT:

- Determine where application of ITS is likely to have favorable benefit/cost ratios.
- Program and prioritize ITS projects for the six-year Highway Improvement Programs.
- Determine what data should be collected for ITS project evaluation.
- Perform life-cycle analysis of ITS projects.

Benefits of This Research

Use of these tools for ITS benefits evaluation is expected to result in more targeted, cost-effective deployment of ITS in Wisconsin. Successful ITS implementation and the resulting traffic improvements are expected to lead to:

- Fewer crashes and fatalities
- Faster clearance of crash vehicles and other incidents
- Less travel time, greater predictability of travel time
- Increased traffic throughput